Medicine Bow National Forests
Landscape Vegetation Analysis

Background: The following are some possible metrics/key indicators to use for water resource effects analysis for the Medicine Bow National Forest Landscape Vegetation Analysis (LaVA). A similar approach can be used to calculate other metrics if desired. This document is intended to provide a logical/simple/defensible/understandable set of metrics that could be used to support a conditional NEPA based effects analysis; this document is not intended to be the effects analysis.

Treatment opportunity areas have been identified. The overall levels of proposed activities have been defined at the project level, but not allocated across the landscape (i.e. units have not been delineated and currently are not proposed to be delineated until the implementation phase). The conditional NEPA challenge under this scenario is to provide a site-specific effects analysis, without actual treatments being delineated. The approach below provides one way to quantify likely proposed activity affects to water resources across the entire project area (e.g. wetland impacts across the project area), but does not address site specific impacts to individual water resources within the project area.

Analysis approach: Similar activities (harvest, roads) to those proposed in LaVA have been implemented over the life (2004-2017) of the existing Medicine Bow National Forest Land and Resource Management Plan (Forest Plan), following existing Forest Plan Standards and Guidelines. Spatial information is available for activities that have been implemented. Spatial water resources information is available. By overlaying various activities (e.g. roads/harvest) that have occurred with various water resource indictors (wetlands, water influence zone), we can quantify the spatial extent of past activities in relationship to water resources. This information can then be used to proportionally estimate the quantity of proposed activities, across the project area, in relationship to water resources. For example, if there have been 100 acres of past harvest and 15 acres of that harvest have occurred in the Water Influence Zone, and if we are proposing 1000 acres of new harvest, we could estimate 150 acres of the new harvest may occur in the Water Influence Zone (15/100 : 150/1000) and the remaining 850 acres can be assumed to occur outside of the WIZ. Potential effects can then be discussed using the quantitative values for activities within and outside of the WIZ. I would consider these metrics or indicators the “most probable”, rather than “worst case”, scenario under full implementation of the LaVA proposed action (11/15/17) as they are proportional projections based on actual activities that have occurred while implementing the current Forest Plan.

Analysis timeframe: Metrics are presented for two timeframes. In order to provide a context for existing conditions, readily available data as far back in time as was readily available was utilized. For instance, harvest activities were considered from 1934 – 2017. In order to predict metrics for proposed/future activities, the analysis limits the timeframe to the current Forest Plan period (2004-2017), as the activities implemented during this time frame are believed to be the best predictor of future activities, since the management plan and management direction are most similar to the current situation. Per the 11/15/17 Landscape Vegetation Analysis proposed action document, future activities are displayed over a 15 year implementation timeframe (2019-2034). The LaVA No Action Alternative – Current Management (11/9/18 document) has also been summarized.

Analysis Assumptions:

- Harvest and road activity data are a reasonable representation of activities on the ground.
- Wetland/WIZ data are a reasonable representation of conditions on the ground.
- Activities implemented under the current Forest Plan from 2004-2017 are a reasonable predictor of how and where future activities will be implemented.

Dave Gloss, Hydrologist
11/27/18 (Updated to include Current Management Alternative (No Action Alternative))
3/4/19 (Updated to include B.Owens assessment of harvest in WIZ in WUI/CAR)

HARVEST: WATER INFLUENCE ZONE Indicator/Metric (streams, lakes/ponds, wetlands) Table

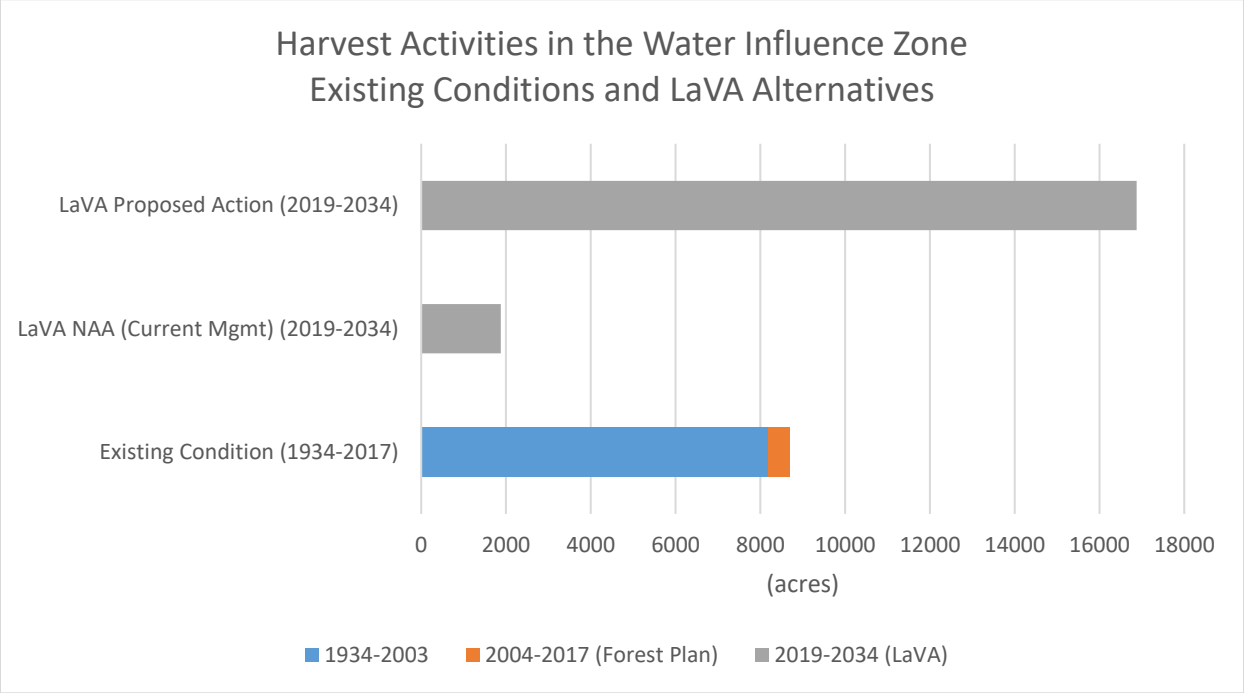
Background	
Water Influence Zone in Project Area (streams, lakes/ponds, wetlands)	123,023 acres
Existing Conditions	
Harvest (1934 – 2017)	139,129 acres
Harvest in WIZ (1934 – 2017)	8,695 acres (6.25%)
Current Forest Plan Period (used to project forward for LaVA)	
Harvest (2004 – 2017)	7,685 acres
Harvest in WIZ (2004 – 2017)	499 acres (6.49%)
Lava No Action (Current Management) – Projections (proposed even and un-even age harvest)	
Lava NAA (Current Mgt) Harvest (~2019-2034)	28,890 acres[1]
Lava NAA (Current Mgt) Projected Harvest in WIZ (~2019-2034)	1,875 acres (6.49%)
Lava Proposed Action – Projections (proposed even and un-even age harvest)	
Lava Proposed Action Harvest (~2019-2034)	260,000 acres[2]
Lava Proposed Action Projected Harvest in WIZ	16,874 acres (6.49%)

[1] 20,280 timber harvest + 7,680 PCT + 930 W&R

[2] 95,000 even-aged + 165,000 un-even aged

Dave Gloss, Hydrologist
11/27/18 (Updated to include Current Management Alternative (No Action Alternative))
3/4/19 (Updated to include B.Owens assessment of harvest in WIZ in WUI/CAR)

HARVEST: WATER INFLUENCE ZONE Indicator/Metric (streams, lakes/ponds, wetlands) Graph



Dave Gloss, Hydrologist
11/27/18 (Updated to include Current Management Alternative (No Action Alternative))
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Supplemental Analysis: Additional information and analysis was requested by the LaVA Steering Committee and the Wyoming Game and Fish Department (M.Conrad), related to the Harvest in Water Influence Zone metric above.

From the February 25, 2019 LaVA Steering Committee notes:
"WIZ Exercise: Josh and Brooke overlaid the WIZ/CAR/TOA layers to determine how many WIZ acres are in the analysis area. They came up with 80,000 acres. The next step will be to subtract out any historic work that was completed in the WIZ so as to determine a final number. The exercise was done to validate how much WIZ is in the analysis and to determine how much could potentially be affected by project implementation, despite avoidance, where possible, and the implementation of project design features."

An email summarizing the additional analysis is provided below:

Dave Gloss, Hydrologist
11/27/18 (Updated to include Current Management Alternative (No Action Alternative))
3/4/19 (Updated to include B.Owens assessment of harvest in WIZ in WUI/CAR)

Gloss, Dave -FS

From: Armbruster, Jason M -FS
Sent: Thursday, February 28, 2019 10:00 AM
To: Gloss, Dave -FS
Subject: FW: WIZ Exercise

Jason Armbruster
District Ranger
Forest Service
Medicine Bow-Routt National Forests and Thunder Basin National Grassland,
Brush Creek/Hayden Ranger District
p: 307-326-2501
c: 970-462-8456
f: 307-326-5250
jason.m.armbruster@usda.gov
2171 S. Highway 130, P.O. Box 249
Saratoga, WY 82331
www.fs.fed.us
Caring for the land and serving people

From: Owens, Brooke - FS
Sent: Monday, February 25, 2019 4:12 PM
To: Peck, Joshua P -FS <jpeck@fs.fed.us>; Martin, Melissa M -FS <mmmartin@fs.fed.us>
Cc: Romero, Frank E -FS <feromero@fs.fed.us>; Armbruster, Jason M -FS <jasonmarmbruster@fs.fed.us>
Subject: WIZ Exercise

Here's the outcome of the WIZ Exercise, the WIZ layer used was created using Dave's guide and is at this location T:\FS\NFS\MBRTB\Project\SO\1950LandscapeVegAnalysis\GIS_EIS_UseMe\Data\WIZ\

- 77,088 acres of WIZ in the TOAs, and of that
  - 37,257 acres (48%) are in the WUI/CAR areas.
- 5,351 acres (6.94%) of past vegetation treatment within the WIZ layer, and of that
  - 2,547 acres (6.8%) fall into the WUI layer.

Without talking to Dave and not fully understanding his process, I'm not sure that comparing what we've done is helpful. Maybe someone else can shed some light, if not I will tie in with him when he's back from leave.

From the direct & indirect effects under the modified proposed action in the hydrology section:

Water Quality – Harvest Treatments

"Table 48 shows existing and projected quantities of harvest in the Water Influence Zone (Gloss, 2018). Harvest treatments in the Water Influence Zone can be used as a quantitative indicator to estimate the potential indirect effects of the proposed project. The projected harvest in the water influence zone under the modified proposed action would

be 16,874 acres (6.49 percent). The amount of harvest in the water influence zone is expected to be twice the amount of harvest in the water influence zone that has occurred on the Medicine Bow since the 1930s or about 34 times the amount of harvest that has occurred in the water influence zone in the last 14 years while implementing the current forest plan."

Brooke Owens,
TMA
Forest Service
Medicine Bow-Routt National Forests and Thunder Basin National Grassland, Laramie Ranger District
p: 307-745-2338
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This additional analysis differs from the Harvest in Water Influence Zone metric in that Treatment Opportunity Areas, rather than the entire analysis area, were used as an overlay. This effectively displays a subset of the data presented in the Harvest in Water Influence Zone metric. The additional analysis also quantifies the harvest in or near riparian areas that has occurred in areas delineated as Wildland Urban Interface (WUI) and/or Communities At Risk (CAR). The primary new information or conclusion from the additional analysis is provided below:

Based upon an analysis of past activities, approximately half of the harvest in or near riparian areas has occurred in areas delineated as Wildland Urban Interface (WUI) and/or Communities At Risk (CAR).

Dave Gloss, Hydrologist
11/27/18 (Updated to include Current Management Alternative (No Action Alternative))
3/4/19 (Updated to include B.Owens assessment of harvest in WIZ in WUI/CAR)

HARVEST: WETLAND Indicator/Metric (*Direct Effect*) Table

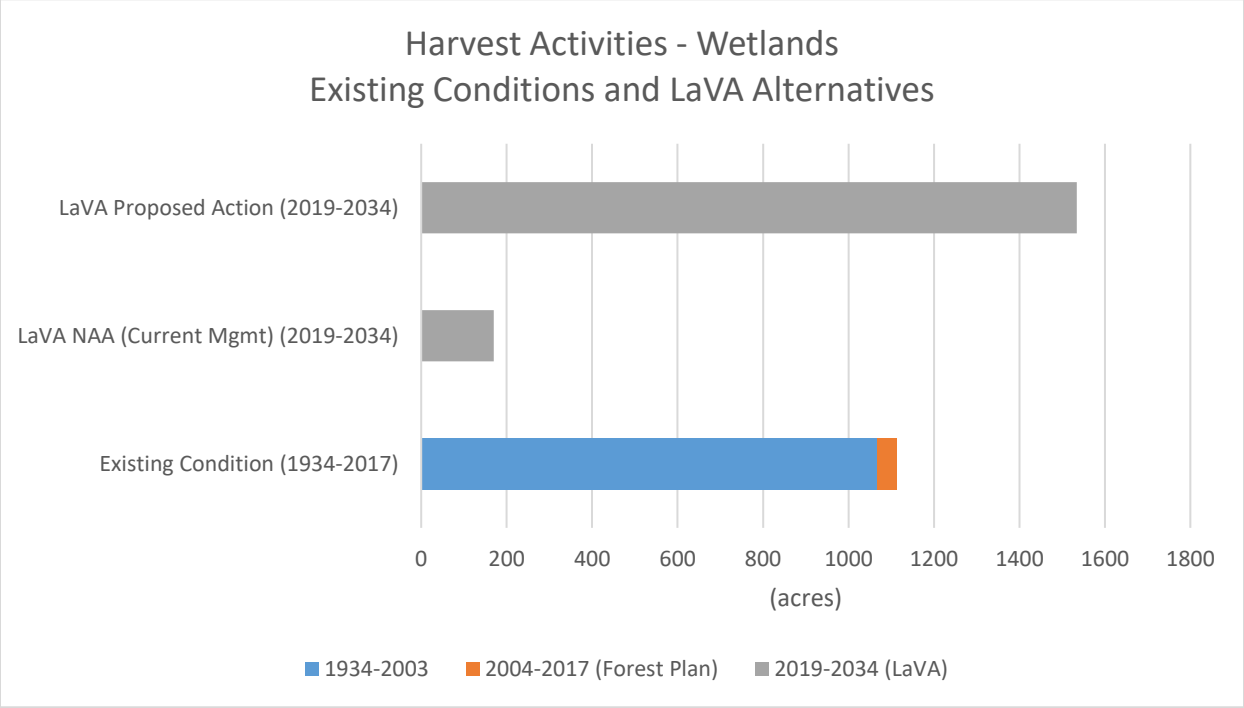
Background	
Wetlands in Project Area	27,594 acres
Existing Conditions	
Harvest (1934 – 2017)	139,129 acres
Harvest in Wetlands (1934 – 2017)	1,112 acres (0.80%)
Current Forest Plan Period (used to project forward for LaVA)	
Harvest (2004 – 2017)	7,685 acres
Harvest in Wetland (2004 – 2017)	45.3 acres (0.59%)
Lava No Action (Current Management) – Projections (proposed even and un-even age harvest)	
Lava NAA (Current Mgt) Harvest (~2019-2034)	28,890 acres[1]
Lava NAA (Current Mgt) Projected Harvest in Wetlands (~2019-2034)	170 acres (0.59%)
Lava Proposed Action – Projections (proposed even and un-even age harvest)	
Lava Proposed Action Harvest (~2019-2034)	260,000 acres[2]
Lava Proposed Action Projected Harvest in Wetlands	1,534 acres (0.59%)

[1] 20,280 timber harvest + 7,680 PCT + 930 W&R

[2] 95,000 even-aged + 165,000 un-even aged

Dave Gloss, Hydrologist
11/27/18 (Updated to include Current Management Alternative (No Action Alternative))
3/4/19 (Updated to include B.Owens assessment of harvest in WIZ in WUI/CAR)

HARVEST: WETLAND Indicator/Metric (*Direct Effect*) Graph



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3/4/19 (Updated to include B.Owens assessment of harvest in WIZ in WUI/CAR)

HARVEST: WATER INFLUENCE ZONE SURROUNDING WETLANDS (inclusive of wetlands) (*Indirect Effect*) Table

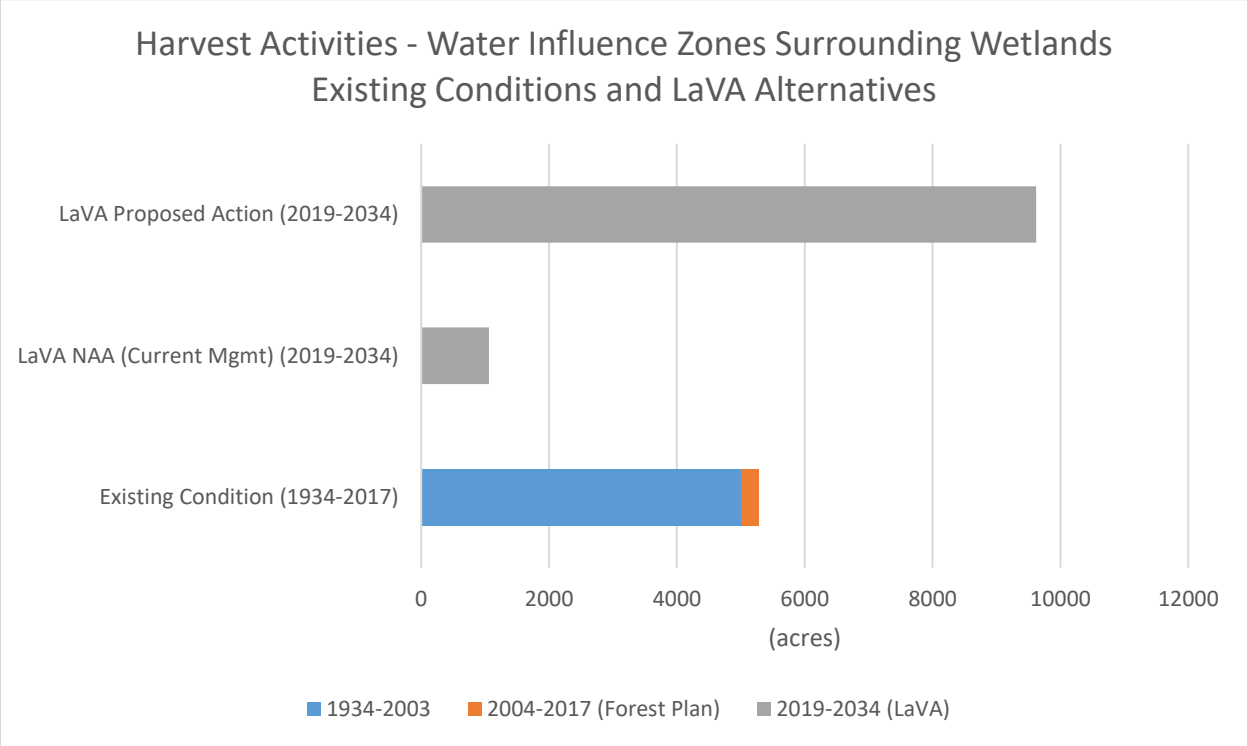
Background	
Water Influence Zone in Project Area (wetlands)	74,674 acres
Existing Conditions	
Harvest (1934 – 2017)	139,129 acres
Harvest in Water Influence Zone Surrounding Wetlands (1934 – 2017)	5,281 acres (3.80%)
Current Forest Plan Period (used to project forward for LaVA)	
Harvest (2004 – 2017)	7,685 acres
Harvest in Water Influence Zone Surrounding Wetlands (2004 – 2017)	282 acres (3.67%)
Lava No Action (Current Management) – Projections (proposed even and un-even age harvest)	
Lava NAA (Current Mgt) Harvest (~2019-2034)	28,890 acres[1]
Lava NAA (Current Mgt) Projected Harvest in Water Influence Zone Surrounding Wetlands (~2019-2034)	1,060 acres (3.67%)
Lava Proposed Action – Projections (proposed even and un-even age harvest)	
Lava Proposed Action Harvest (~2019-2034)	260,000 acres[2]
Lava Proposed Action Projected Harvest in Water Influence Zone Surrounding Wetlands (~2019-2034)	9,620 acres (3.67%)

[1] 20,280 timber harvest + 7,680 PCT + 930 W&R

[2] 95,000 even-aged + 165,000 un-even aged

Dave Gloss, Hydrologist
11/27/18 (Updated to include Current Management Alternative (No Action Alternative))
3/4/19 (Updated to include B.Owens assessment of harvest in WIZ in WUI/CAR)

WATER INFLUENCE ZONE SURROUNDING WETLANDS (inclusive of wetlands) (*Indirect Effect*) Graph



Dave Gloss, Hydrologist
11/27/18 (Updated to include Current Management Alternative (No Action Alternative))
3/4/19 (Updated to include B.Owens assessment of harvest in WIZ in WUI/CAR)

ROADS: WATER INFLUENCE ZONE Indicator/Metric (streams, lakes/ponds, wetlands) Table

Background	
Water Influence Zone in Project Area (streams, lakes/ponds, wetlands)	123,023 acres
Existing Conditions	
NFS Roads (FS jurisdiction)	2,113 miles
NFS Roads in WIZ	224 miles (10.6%)
Current Forest Plan Period (used to project forward for LaVA)	
Temporary Road Construction (2004 – 2017)	30.2 miles
Temporary Road Construction in WIZ (2004 – 2017)	0.6 miles (1.99%)
Lava No Action (Current Management) – Projections (temporary road construction)	
Lava NAA (Current Mgt) – Road Construction (~2019-2034)	75 miles[1]
Lava NAA (Current Mgt) Projected Road Construction[1] in WIZ (~2019-2034)	1.5 miles (1.99%)
Lava Proposed Action – Projections (temporary road construction)	
Lava Proposed Action – Road Construction (~2019-2034)	600 miles[1]
Lava Proposed Action Projected Road Construction[1] in WIZ	12 miles (1.99%)

[1] Temporary roads

Dave Gloss, Hydrologist
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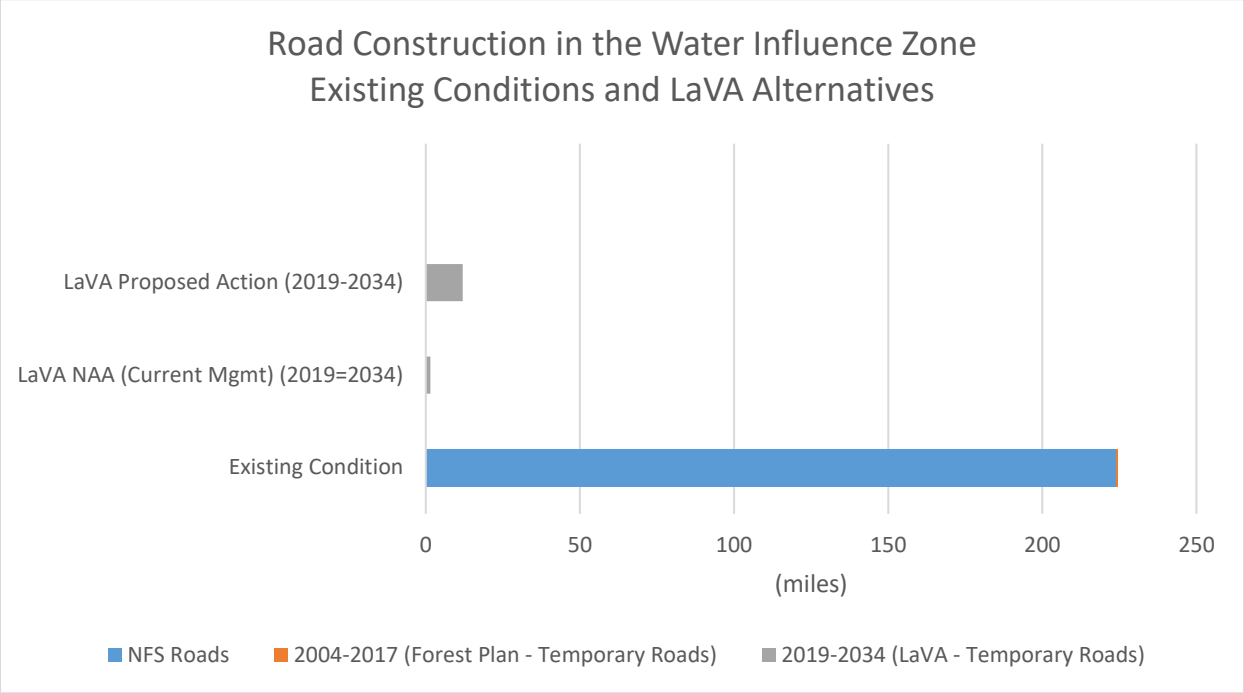
ROADS: WATER INFLUENCE ZONE Indicator/Metric (streams, lakes/ponds, wetlands) Graph



ROADS: WETLAND Indicator/Metric (*Direct Effect*) Table

Background	
Wetlands in Project Area	27,594 acres
Existing Conditions	
NFS Roads (FS jurisdiction)	2,113 miles
NFS Roads in Wetlands	15.3 miles (0.72%)
Current Forest Plan Period (used to project forward for LaVA)	
Temporary Road Construction (2004 – 2017)	30.2 miles
Temporary Road Construction in Wetland (2004 – 2017)	0.04 mile (0.13%)
Lava No Action (Current Management) – Projections (temporary road construction)	
Lava NAA (Current Mgt) – Road Construction (~2019-2034)	75 miles[1]
Lava NAA (Current Mgt) Projected Road Construction[1] in Wetlands (~2019-2034)	0.1 mile (0.13%)
Lava Proposed Action – Projections (temporary road construction)	
Lava Proposed Action – Road Construction (~2019-2034)	600 miles[1]
Lava Proposed Action Projected Road Construction[1] in Wetland	0.8 mile (0.13%)

[1] Temporary roads

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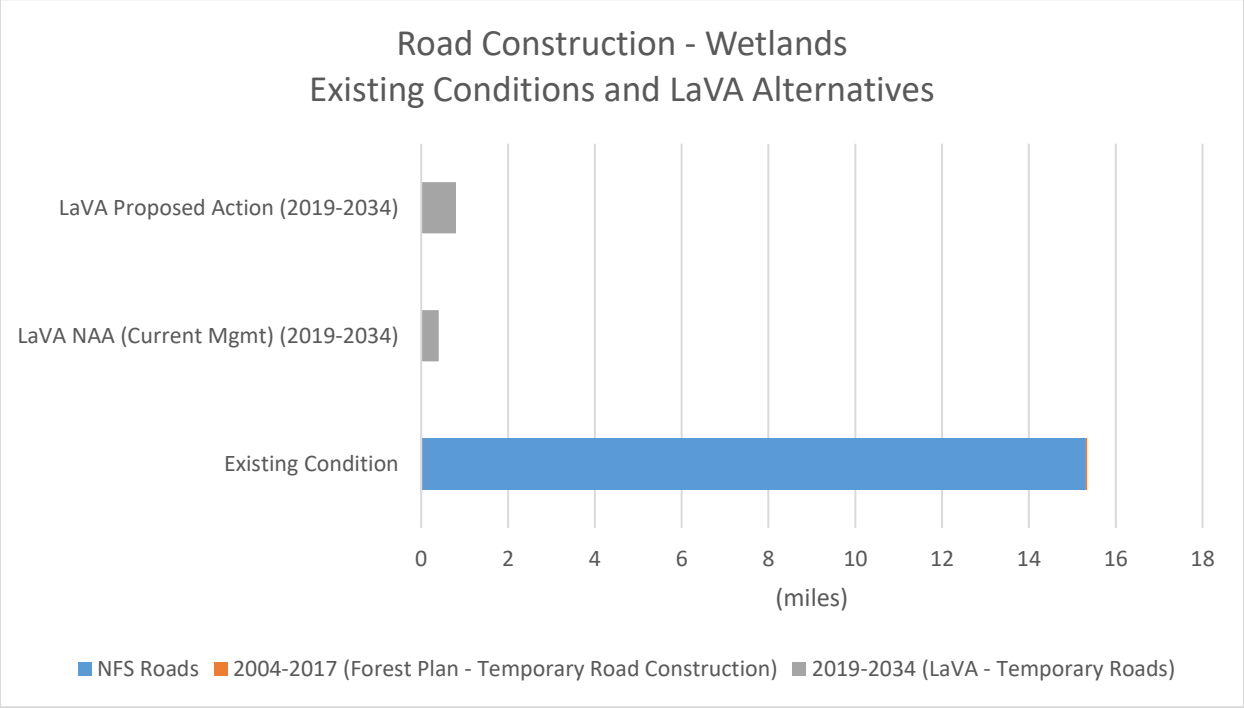
ROADS: WETLAND Indicator/Metric (*Direct Effect*) Graph



ROADS: WATER INFLUENCE ZONE SURROUNDING WETLANDS (inclusive of wetlands) (*Indirect Effect*)
Table

Background	
Water Influence Zone in Project Area (wetlands)	74,674 acres
Existing Conditions	
NFS Roads (FS jurisdiction)	2,113 miles
Roads in Water Influence Zone Surrounding Wetlands	126 miles (5.96%)
Current Forest Plan Period (used to project forward for LaVA)	
Temporary Road Construction (2004 – 2017)	30.2 miles
Temporary Road Construction in Water Influence Zone Surrounding Wetlands (2004 – 2017)	0.36 miles (1.19%)
Lava No Action (Current Management) – Projections (temporary road construction)	
Lava NAA (Current Mgt) – Road Construction (~2019-2034)	75 miles[1]
Lava NAA (Current Mgt) Projected Road Construction[1] in Water Influence Zone Surrounding Wetlands (~2019-2034)	0.9 mile (1.19%)
Lava Proposed Action – Projections (temporary road construction)	
Lava Proposed Action – Road Construction (~2019-2034)	600 miles[1]
Lava Proposed Action Projected Temporary Road Construction in Water Influence Zone Surrounding Wetlands (~2019-2034)	7 miles (1.19%)

[1] Temporary roads

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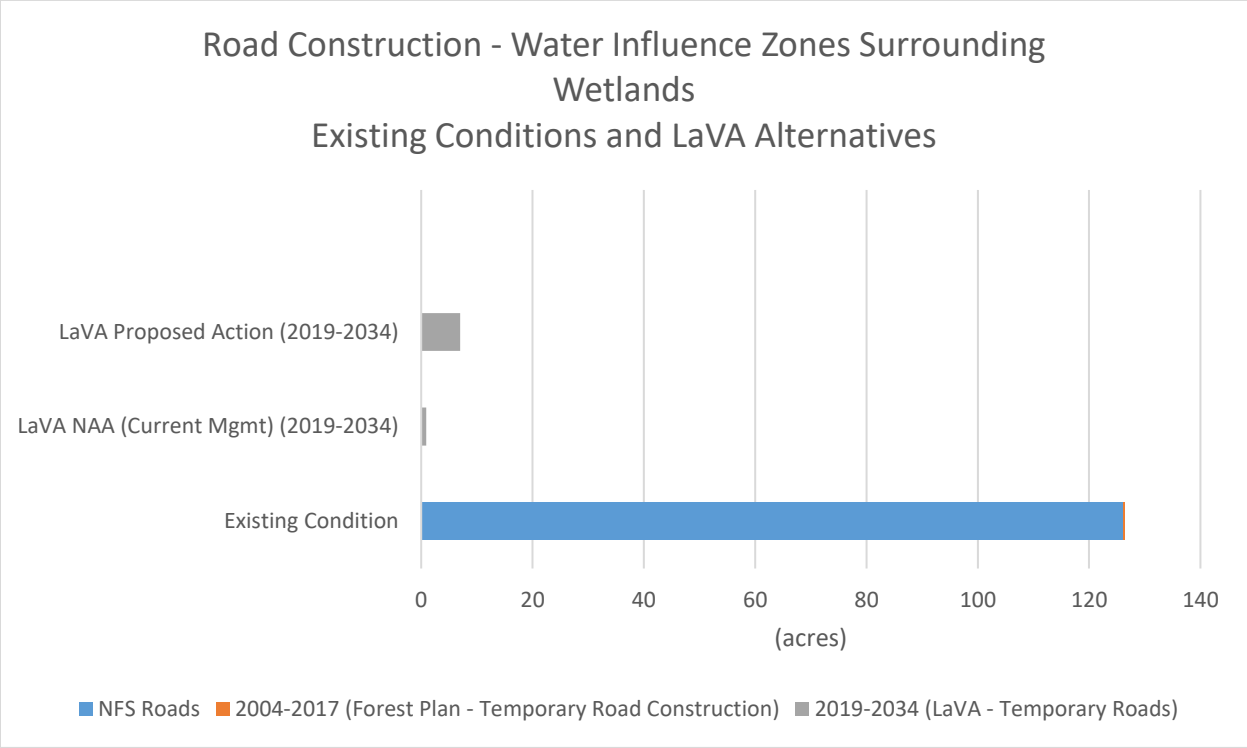
ROADS: WATER INFLUENCE ZONE SURROUNDING WETLANDS (inclusive of wetlands) (*Indirect Effect*) Graph



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ROADS: STREAM CROSSINGS Indicator/Metric (*Direct Effect*) Table

Existing Conditions	
NFS Roads (FS jurisdiction)	2,113 miles
NFS Roads – Stream Crossings	Perennial Streams: 590 Intermittent Streams: 843 Ephemeral Streams: 1401
Current Forest Plan Period (used to project forward for LaVA)	
Temporary Road Construction (2004 – 2017)	30.2 miles
Temporary Road Construction Stream Crossings (2004 – 2017)	Perennial Streams: 1 Intermittent Streams: 3 Ephemeral Streams: 23
Lava No Action (Current Management) – Projections (temporary road construction)	
Lava NAA (Current Mgt) – Road Construction (~2019-2034)	75 miles[1]
Lava NAA (Current Mgt) Projected Road Construction[1] Stream Crossings	Perennial Streams: 3 Intermittent Streams: 8 Ephemeral Streams: 57
Lava Proposed Action – Projections (temporary road construction)	
Lava Proposed Action – Road Construction (~2019-2034)	600 miles[1]
Lava Proposed Action Projected Road Construction[1] Stream Crossings	Perennial Streams: 20 Intermittent Streams: 60 Ephemeral Streams: 457

[1] Temporary roads

Dave Gloss, Hydrologist
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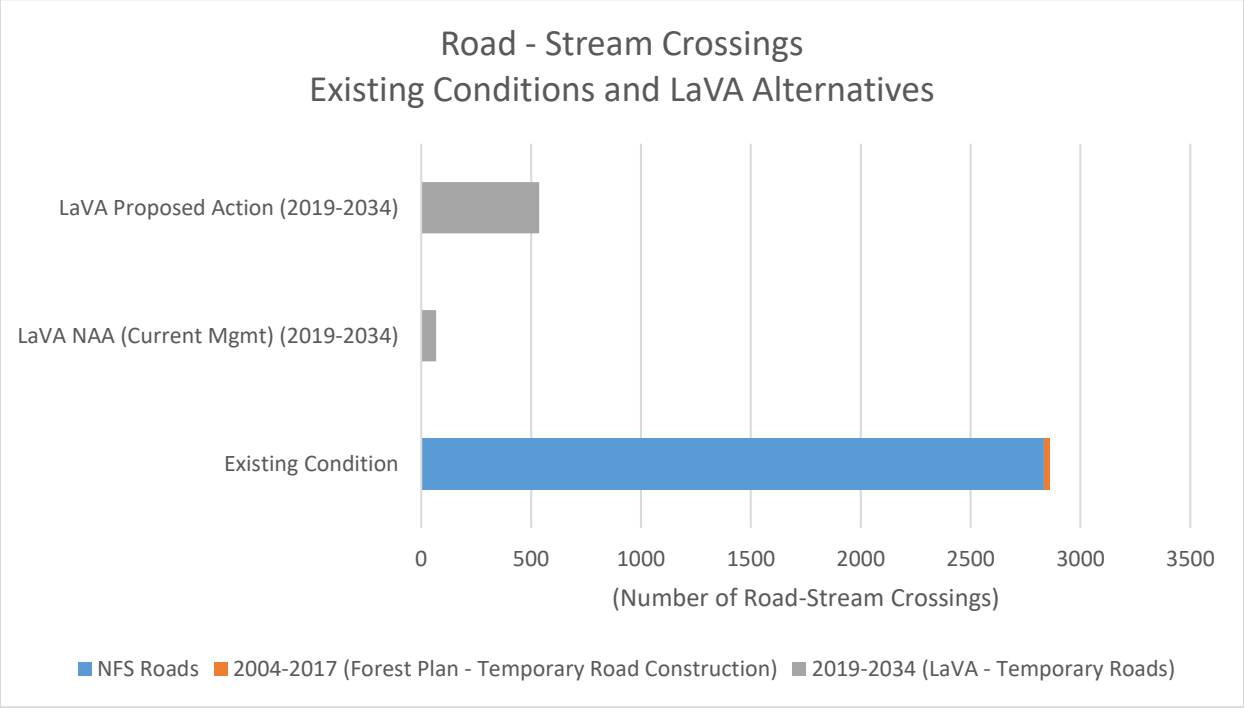
ROADS: STREAM CROSSINGS Indicator/Metric (*Direct Effect*) Graph



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DATA SOURCES / NOTES

Harvest: In October 2017, harvest activities on the Forest were compiled from the FACTS database by Bill Overland for use in the Equivalent Clearcut Area modelling for the LaVA project. Records date from 1934 to 2017 and show a total of 139, 219 acres of harvest on the Forest during this time period. When overlapping activities occurred in the same stand, the most recent record was retained and the others were removed.

Harvest Data:
1934-2017: T:\FS\NFS\MBRTB\Program\2500Watershed\GIS\MB\Timber\LandscapeVeg\Lava_Water.gdb\HarvestHistory_final_100517
2004-2017: T:\FS\NFS\MBRTB\Program\2500Watershed\GIS\MB\Timber\LandscapeVeg\Lava_Water.gdb\HarvestHistoryFP2004_2017

Water Influence Zone: "The land next to water bodies where vegetation plays a major role in sustaining long-term integrity of aquatic systems. It includes the geomorphic floodplain (valley bottom), riparian ecosystem, and inner gorge. Its minimum horizontal width (from top of each bank) is 100 feet or the mean height of mature dominant late-seral vegetation, whichever is most." (Forest Service Handbook 2509.25). Spatial water influence zone (WIZ) layers created by Steve Mottus (retired USFS GIS specialist) exist for wetlands, streams and lakes/ponds. I merged, then dissolved the three individual layers into one "Water Influence Zone" layer.

Water Influence Zone Data:
Streams: T:\FS\NFS\MBRTB\Program\2500Watershed\GIS\MB\Timber\LandscapeVeg\Lava_Water.gdb\WIZ_Streams_LaVA
Lakes/Ponds:
T:\FS\NFS\MBRTB\Program\2500Watershed\GIS\MB\Timber\LandscapeVeg\Lava_Water.gdb\WIZ_LakePondResevoir_LaVA
Wetlands: T:\FS\NFS\MBRTB\Program\2500Watershed\GIS\MB\Timber\LandscapeVeg\Lava_Water.gdb\WIZ_NWIwetland_LaVA
Water Influence Zone:
T:\FS\NFS\MBRTB\Program\2500Watershed\GIS\MB\Timber\LandscapeVeg\Lava_Water.gdb\WIZ_StreamsLakesWetlands_LaVA

Roads: Existing National Forest System roads were obtained from the INFRA database. Road construction for harvest activities during the current Forest Plan cycle was compiled during 2017. No new system roads have been constructed during the current Forest Plan. Approximately 30 miles of temporary road were constructed 2004-2017 to support harvest activities.

Roads Data:
Existing NFS Roads:
T:\FS\NFS\MBRTB\Program\2500Watershed\GIS\MB\Timber\LandscapeVeg\Lava_Water.gdb\RoadCoreFS_USA_Lava
Temporary Roads (FP 2004-2017):
T:\FS\NFS\MBRTB\Program\2500Watershed\GIS\MB\Timber\LandscapeVeg\Lava_Water.gdb\TempRds_FP_2004_2017

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